

**[Claim(s)]****[Claim 1]**

**An optical disk drive apparatus, comprising:**

**a means for equipping with an optical disk arbitrarily, a means for rotating the optical disk at a constant speed,**

**a means for irradiating a laser beam at a track position of the optical disk which is rotating,**

**a means for modulating the laser beam, and recording information to the optical disk or regenerating recorded information by receiving the reflected light from the track, further comprising:**

**a laser beam scanning means for reciprocating an irradiated position of the laser beam on the optical disk along the track within a fixed range periodically when the optical disk equipped is CLV system,**

**a means for adjusting a direction of movement, speed and the range at the time of reciprocating the irradiated position in accordance with a position of a radial direction of the optical disk, and adjusting the speed of the irradiated position on the track to a linear speed of the CLV system within a fixed range on one way,**

**an optical disk-accessing means for recording information to the optical disk or regenerating recorded information in a period when the speed is the linear speed of the CLV system.**

**[Claim 2]**

**The optical disk drive apparatus according to claim 1, further comprising:**

**a recording buffer memory for storing temporarily information which is input externally,**

**a sequential recording means for reading information stored in the buffer memory by increments and recording it to the optical disk by using the optical disk-accessing means,**

**a regenerating buffer memory for storing temporarily information regenerated by increments by using the optical disk-accessing means, and**

**an output means for outputting information stored in the regenerating buffer memory collectively.**

**[Claim 3]**

**The optical disk drive apparatus according to claim 1, wherein**

**the laser beam scanning means has a mirror which reflects the laser beam emitted from the light source to the optical disk, and**

**a mirror biaxial driving means for driving the irradiated position of the laser beam to a radial direction of the optical disk and a tangential direction of the track by driving the mirror biaxially.**

[0001]

The present invention relates to an optical disk drive apparatus.

[0002]

[Description of the Prior Art]

Cartridge-type optical disk apparatus which can detach and attach arbitrarily a cartridge which builds in the optical disk to an optical disk drive device is often used.

[0003] There are a CAV (Constant Angular Velocity: rotation angle regularity) system and a CLV (Constant Linear Velocity: linear velocity regularity) system in an optical disk unit as fundamental speed control systems at the time of rotating an optical disk. CAV always rotates an optical disk with constant speed, and CLV changes rotational speed according to the track position to access, and makes linear velocity constant at which laser spot passes on a track.

[0004] These two systems are incompatible because the sector arrangement of the optical disk and the control circuit of the optical disk drive device are different each other.

[0005] This point is improved and the method of the optical disk of CLV also accessing with the optical disk drive device of CAV is known. This method changes the frequency of the clock signal for carrying out read/write of one every pit of the data instead of rotating an optical disk with constant speed, when equipped with the optical disk of CLV.

[0006] In the case of this method, it is necessary to change a clock signal in a frequency range large like 2.5-5MHz, for example and, and if it is not what does not have a frequency change and was stabilized, it will not become.

[0007] By the way, in order to change the frequency of a clock signal as mentioned above, the test frequency of the PLL (Phase Locked Loop) circuit which generates a clock signal is made to change.

[0008] There are an analog form and a digital system in this PLL circuit. In the case of an analog form, a VCO (Voltage Controlled Oscillator) circuit is used. However, it is difficult to be one VCO circuit and to change frequency over the above large frequency ranges in this case. For this reason, it must have multiple circuits and a circuit becomes complicated.

[0009] Meanwhile, in the case of a digital system, the HARASHIN item of high frequency will be generated and dividing of the high frequency will be carried out by various integer ratios. In this case, when it is going to obtain the arbitrary frequency of 2.5-5MHz as mentioned above, a high frequency signal which it says, for example is 2000GHz is needed as a HARASHIN item. However, it is difficult to generate such a high frequency signal or to carry out dividing in the usual digital circuit.

[0010]

[Problem(s) to be solved by the invention]

Thus, conventionally it was one optical disk drive device, and when it was going to access each optical disk of CAV and CLV, there was a problem of becoming intricately a circuit configuration and difficult.

[0011] A present invention solves the above-mentioned problem, it is simple for a circuit configuration and an object of a present invention is to provide the optical disk drive device which can access each optical disk of CAV and CLV.

[0012]

[Means for Solving the Problem]

For this reason, a present invention in an optical disk drive device of CAV which carries out constant speed rotation of the optical disk when equipped with an optical disk of CLV makes only a fixed range go and come back to an irradiation position of a laser beam to an optical disk periodically along a track, and by adjusting a direction of movement, speed, and a range in the case of the round trip according to a location of a radial direction of an optical disk, in a one-way fixed range, it was made to perform record and reproduction motion of information during a period which drift speed of a laser beam on a track is made to become the linear speed of CLV, and has linear velocity of the CLV to an optical disk.

[0013]

[Function]

Since what is necessary is just to be able to access each optical disk of CAV and CLV, not to change the test frequency of a PLL circuit like before in this case, and to make the direction of radiation of a laser beam go back and forth in a fixed range, equipment can consist of comparatively easy circuits.

[0014]

[Example]

Hereafter, the case of the operation of a present invention is described in detail, referring to an accompanying drawing.

[0015] Fig. 1 shows the outline block diagram of the optical disk drive device related to one case of the operation of a present invention. The operator equips this optical disk unit with the optical disc cartridge which is not illustrated arbitrarily. Optical disk 1 in the optical disc cartridge with which it was equipped is driven with spindle motor 2. Optical head 3 is allocated in the 1 side lower part of optical disk 1. This optical head 3 is driven to the radial direction of optical disk 1 by axial flutter motor 4. Although not illustrated, the linear encoder which detects the movement zone of optical head 3, the sensor which reads the cartridge identifier currently formed in the case body of the above-mentioned optical disc cartridge, etc. are allocated.

[0016] Fig. 2 shows the block diagram of optical head 3 inside. In a Fig., the laser beam emitted from semiconductor laser 31 passed along coupling lens 32, and has entered into beam splitter 33. It reflects by beam splitter 33, and reflects further with galvanomirror 34, and the incident light is irradiated by optical disk 1 through narrowing-down lens 35.

[0017] The reflected light from optical disk 1 is a course opposite to the above, and goes back to beam splitter 33. This incoming light passes beam splitter 33, passes condenser 36 and

enters into light sensing portion 37. Light sensing portion 37 outputs a tracking error signal, a focus error signal, and the regenerative signal of recording information.

[0018] Although not illustrated, galvanomirror 34 is supported with two axes which intersect perpendicularly. And the dual shaft actuator which rotates galvanomirror 34 with the two axes, and moves the laser spot on optical disk 1 to the radial direction of optical disk 1 and the tangential adjusting of a track is allocated. The sensor which detects the rotation angle of galvanomirror 34 is allocated. The actuator evening which moves narrowing-down lens 35 to an optical axis direction is allocated.

[0019] Fig. 3 shows the block configuration figure of this optical disk unit. In the Fig., the focus error signal outputted from light sensing portion 37 is inputted into focusing control circuit 101, and the output is inputted into amplifier 102. And actuator 103 which drives narrowing-down lens 35 is driving with the output of amplifier 102.

[0020] The tracking error signal outputted from light sensing portion 37 is inputted into tracking servo control circuit 104, and the output is inputted into amplifier 105. And one axis of dual shaft actuator 106 which drives galvanomirror 34 is driving with the output of the amplifier 105. The output signal of sensor 107 which detects the rotation angle of galvanomirror 34 is inputted into beam scanning voltage generation circuit 108. The output is inputted into amplifier 109 and the axis of another side of dual shaft actuator 106 is driving it with the output of the amplifier 109.

[0021] The output of seek control circuit 110 is inputted into amplifier 111, and arial flutter motor 4 is driving it with the output. The detection double item of linear encoder 112 which detects the location of optical head 3, and the detection signal of cartridge identifiers sensors 113 which read the cartridge identifier of an optical disk cartridge case object are inputted into microcomputer 114.

[0022] The control signal is outputted to the above-mentioned focusing control circuit 101, tracking servo control circuit 104, beam scanning voltage generation circuit 108, seek control circuit 110, spindle motor driving circuit 115, and data logging and a regenerating section 116 from microcomputer 114, respectively. Spindle motor driving circuit 115 is driving spindle motor 2. The regenerative signal outputted from light sensing portion 37 is inputted into data logging and regenerating section 116. Data logging and regenerating section 116 drive semiconductor laser 31, and it is connected to the host side device.

[0023] It is the above structure, next operation of the optical disk drive device of this example is described. This optical disk unit will supervise wearing of an optical disc cartridge, if device power is turned on as shown in Fig. 4 (processing 201). Now, supposing it is equipped with an optical disc cartridge by operator (Y of processing 201), spindle motor driving circuit 115 will be operated and spindle motor 2 will be driven by it. At this example, spindle motor 2 is always rotated with constant speed (processing 202). Subsequently, optical head 3 is moved to a predetermined home position with seek control circuit 110 and amplifier 111, detecting a

movement zone by linear encoder 112 (processing 203).

[0024] While starting the drive of semiconductor laser 31 and making a laser beam emit, the control action of focusing control circuit 101 and tracking servo control circuit 104 is made to start. That is, the laser beam emitted from semiconductor laser 31 is irradiated by optical disk 1, and the reflected light is detected by light sensing portion 37. At this time, light sensing portion 37 outputs a focusing error signal and a tracking error signal. Focusing control circuit 101 outputs a predetermined control signal based on a focusing error signal. Actuator 103 operates with this control signal, it narrows down, and lens 35 drives. Thereby, focusing control which forms predetermined laser spot in an optical disk is performed. Tracking servo control circuit 104 outputs a predetermined control signal based on the above-mentioned tracking error signal. Dual shaft actuator 106 operates with this control signal, and one axis of galvanomirror 34 drives. Thereby, predetermined tracking control which makes laser spot follow in footsteps of a track position is performed (processing 204).

[0025] Then, reception of the lead/write command from a host side device is supervised (loop of N of processing 205). Supposing it receives a lead or a write command now (Y of processing 205), optical head 3 will be driven to the track position corresponding to the sector specified by spiral flutter seek, i.e., a command, (processing 206).

[0026] By the way, the cartridge identifier is formed in the fixed position of the case body at the optical disc cartridge. This cartridge identifier comprises multiple holes and various specifications of the optical disk, such as whether the optical disk built in is CAV or CLV, are shown by the absence or presence of each hole.

[0027] Here, an optical disk drive device reads the cartridge identifier with cartridge identifier sensors 113 (processing 207), and distinguishes the classification of the optical disk with which it is equipped (processing 208). Now, the cartridge identifier assumes that CAV was shown. In this case, the ID information of each sector of optical disk 1 is detected in (Y of processing 208), and known operation. That is, light sensing portion 37 detects the reflected light from a track, and outputs a regenerative signal. Data logging and regenerating section 116 rework the ID information of each sector based on the regenerative signal (processing 209).

[0028] And if the sector which should be accessed by the ID information is found, read/write will be operated to the sector by data logging and regenerating section 116. That is, in the case of read operation, the record data of a predetermined sector is reworked, and it outputs to the host side. In the case of write operation, semiconductor laser 31 is driven based on the data inputted from the host side, and a laser beam is modulated to it. Thereby, data is recorded on a predetermined sector (processing 210).

Then, it goes back at the following surveillance of command reception (to processing 205).

[0029] Next, suppose that it was equipped with the optical disk of CLV. In this case, although the both-way drive of the axis of (N of processing 208) and another side of galvanomirror 34 which was not driven in the above is carried out within a predetermined angle, that driving

direction, the both-way range, and speed are determined first (processing 211). A driving direction is to which to drive previously in that case, although a both-way drive is carried out a center a fixed position at both sides. These drive methods are beforehand set up fixed according to the track position of the radial direction of optical disk 1.

[0030] Beam scanning voltage generation circuit 108 generates the scanning voltage for driving the galvanomirror 34, detecting the actual manipulated variable of galvanomirror 34 by sensor 107 in accordance with the above-mentioned drive method. Amplifier 109 amplifies the scanning voltage and drives one axis of dual shaft actuator 106 (processing 212).

[0031] The above-mentioned scanning voltage is a signal repeatedly outputted with a constant period, and Fig. 5 (a) shows the voltage waveform of the installment.

The voltage waveform of this scanning voltage changes with track positions to access.

[0032] Now, the track position to access presupposes that it was an outermost periphery side of optical disk 1. In this case, as shown in this Fig. wave W1, a pressure value always changes by zero from fixed voltage positive only in during fixed time T1 to negative fixed voltage. Thereby, galvanomirror 34 rotates and the laser spot on optical disk 1 carries out reciprocation moving only of the fixed range to the tangential adjusting of a track. At this time, tracking control will be performed automatically and laser spot will move along a track. In this case, within the above-mentioned fixed time T1, laser spot moves in the direction of rotation and this direction of optical disk 1 only constant distance in a track top, as direction of movement M1 of Fig. 6 shows.

[0033] This figure 5(b) shows the relative velocity of laser spot and a track. In this case, as shown in speed V1, speed falls at the beginning of the above-mentioned fixed time T1, and it becomes constant speed during fixed time T2 subsequently. And after the above-mentioned fixed time T1, it once falls and returns.

[0034] Parameters are set as follow: the constant speed is V, a linear speed of the optical disk 1 of CLV is a, a radial track position of the optical disk 1 is r, an angular velocity of spindle motor 2 is  $\theta$ . In the present embodiment, the relation  $V = (a/r) - r \cdot \theta$  is realized. According to the relation, the constant speed V becomes equal to the predetermined linear velocity at the time of accessing optical disk 1 of CLV.

[0035] The above-mentioned scanning voltage changes wave W2, W3, W4, W5, and a voltage level as are shown in Fig. 5 (a) and the track position to access moves to the inner circumference side. That is, scanning amplitude of a laser beam will be narrowed and it will not scan in a mid gear as the track mid range to access is approached. In the inner circumference side, scanning amplitude is again made large, so that a scanning direction becomes opposite and it moves to the inner circumference side. And in the track position by the side of the most inner circumference, laser spot moves in the range as a counter direction where said direction of movement M1 is the same, as direction of movement M5 of Fig. 6 shows. At this time, as shown in speed V5 of Fig. 5 (b), the relative velocity of laser spot and a

track rises at the beginning of fixed time T1, it becomes constant speed, and in fixed time T2, subsequently, once rises and returns.

[0036] The relative velocity of laser spot and a track turns into constant speed irrespective of a track position within fixed time T2. Synchronizing with this fixed time T2, microcomputer 114 outputs a read/write timing signal, as shown in Fig. 5 (c). Data logging and regenerating section 116 operate to this timing.

[0037] This optical disk equipment rough-seeks optical head 3 to a predetermined track position in accordance with the received read/write command here. And it searches for the sector which should detect ID information and should access it in the track position (processing 213). If the sector which should be accessed is found, read/write will be operated to a sector. In said fixed time T2, rather than the distance to which laser spot moves a track top, when sector length is long, read/write of the inside of 1 sector is divided and carried out to constant distance [every] multiple times. In this case, since it operates once by the turn of optical disk 1, access of 1 sector will be completed by multiple rotations (processing 214).

[0038] After the above-mentioned access operation is completed, the both-way drive of galvanomirror 34 for scanning a laser beam is suspended (processing 215), and it goes back to the next command reception (processing 205).

[0039] As mentioned above, in this example, in the optical disk drive device made to rotate optical disk 1 with constant speed when equipped with the optical disk of CLV, only a prescribed range is made to go and come back to the laser spot on an optical disk periodically along a track, and as the drift speed of laser spot becomes equal to the linear speed of CLV, it is made to perform record and reproduction motion of information during the period in the fixed range of the one way to an optical disk.

[0040] Thereby, each optical disk of CAV and CLV can be accessed now. Since what is necessary is just not to use a PLL circuit like before in this case, and to make the direction of radiation of a laser beam go back and forth in a fixed range, equipment can consist of comparatively easy circuits.

[0041] By the way, a recording buffer memory 1161 and a regenerating buffer memory 1162 may be installed as shown in Fig. 7 for a case where large quantities of sequential data are recorded to the optical disk 1 and regenerated from the optical disk. In this case, when receiving the data recorded from a host side device, write-in clock signal WC1 is inputted into buffer memory 1161 for record, and the data to record is once stored. And when recording data, corresponding to periodic recording periods, reading clock signal RC1 is inputted intermittently, subsequent data is read, and it records on optical disk 1.

[0042] When reworking data from optical disk 1, data inputs write-in clock signal WC2 into buffer memory 1162 for reworking synchronizing with the cycle by which regenerative data is carried out, and regenerative data is stored one by one. And when the reworking is completed, reading clock signal RC2 is inputted, all the stored data is gathered, and it sends out to the host

side.

[0043] Thus, by having buffer memory 1161 for record, and 1162 for reworking, to the host side, an exchange of data can be summarized at once and can be performed.

[0044] Although the above-mentioned case of the operation described taking the case of the case of the usual optical disk unit, it cannot be overemphasized in optical-magnetic disc equipment that a present invention is similarly applicable.

[0045]

#### [Effect of the Invention]

As mentioned above, according to the present invention, when the optical disk of CLV is equipped with the optical disk drive device of CAV which rotates an optical disk with constant speed, an irradiated position of the laser beam on the optical disk is reciprocated along the track within a fixed range periodically, and actions of recording and regenerating information are performed when the speed of the laser spot on the track becomes equal to the linear speed of the CLV system. Therefore, the optical disk drive device can access with each optical disk of CAV and CLV. Furthermore, complex PLL circuit used before is not required. The apparatus can consist of relatively easy circuits because it is enough to reciprocate the direction of radiation of a laser beam within the fixed range for accessing each of the optical disks.

#### [Brief Description of the Drawings]

##### [Drawing 1]

The outline block diagram of the optical disk drive device related to one case of the operation of a present invention.

##### [Drawing 2]

The block diagram of an optical head.

##### [Drawing 3]

The block configuration figure of the above-mentioned optical disk drive device.

##### [Drawing 4]

The operation flow chart of the above-mentioned optical disk drive device.

##### [Drawing 5]

The diagram showing the scan method of the laser beam by a galvanomirror.

##### [Drawing 6]

The diagram showing the movement state of the laser spot on an optical disk.

##### [Drawing 7]

The block configuration figure of a data logging regenerating section in other cases of the operation.

#### [Description of Notations]

- 1 optical disk
- 2 SPINDLE MOTOR

3 OPTICAL HEAD  
4 ATRIAL FLUTTER MOTOR  
31 semiconductor lasers  
32 COUPLING LENS  
33 BEAM SPLITTER  
34 GALVANOMIRROR  
35 NARROWING-DOWN LENS  
36 CONDENSER  
37 LIGHT SENSING PORTION  
101 FOCUSING CONTROL CIRCUIT  
102,105,109,111 amplifier  
103 ACTUATOR  
104 TRACKING SERVO CONTROL CIRCUIT  
106 DUAL SHAFT ACTUATOR  
107 SENSOR  
108 BEAM SCANNING VOLTAGE GENERATION CIRCUIT  
110 SEEK CONTROL CIRCUIT  
112 LINEAR ENCODER  
113 CARTRIDGE IDENTIFIERS SENSORS  
114 MICROCOMPUTER  
115 SPINDLE MOTOR DRIVING CIRCUIT  
116 DATA LOGGING AND REGENERATING SECTION  
1161 and 1162 Buffer memory